

Appln No. 09/692,554

Amdt date January 4, 2006

Reply to Office action of November 16, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for detecting a tone in a voice packet having a plurality of voice frames, the method comprising:
 - receiving the voice packet over a network;
 - sampling a portion of each of the plurality of voice frames in the received voice packet; and
 - detecting from the sampled portion of the voice frame whether the voice frame comprises the tone, wherein the tone detection is delayed until the last frame of the voice packet is processed received.
2. (Cancelled)
3. (Previously Presented) The method of claim 1 wherein each voice frame includes first and second portions, and wherein the tone detection comprises detecting from the second portion of the frame whether the frame comprises the tone.
4. (Original) The method of claim 3 wherein the first portion of the frame precedes the second portion of the frame in time.
5. (Currently Amended) The method of claim 1 further comprising formatting each voice frame into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, and wherein the tone detection comprises detecting from [[the]] a second portion of the first frame whether the separated component voice frame comprises the tone.

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6. (Original) The method of claim 5 wherein the first portion precedes the second portion in time for each of the first and second frames.

7. (Previously Presented) The method of claim 1 further comprising formatting each voice frame into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, the first portion of the frame precedes the second portion of the frame in time for each of the first and second frames, and bypassing the tone detection step for the first portion of the second frame if the tone detection does not detect the tone in the second portion of the first frame.

8. (Currently Amended) A method of dual tone signal detection in a voice packet having a plurality of voice frames, the method comprising:

receiving the voice packet over a network;

separating the voice packet into its first and second components;

detecting from a portion of the first component whether the first component comprises a first one of the dual tones; and

detecting from a portion of the second component whether the second component comprises a second one of the dual tones, wherein the dual tones detection is delayed until the last frame of the voice packet is processed received.

9. (Previously Presented) The method of claim 8 further comprising formatting the first component into a frame having first and second portions, and wherein the detection of the first one of the dual tones comprises detecting from the second portion of the frame whether the first component comprises the first one of the dual tones.

10. (Original) The method of claim 9 wherein the first portion of the frame precedes the second portion of the frame in time.

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11. (Previously Presented) The method of claim 8 further comprising formatting the first component into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, and wherein the detection of the first one of the dual tones comprises detecting from the second portion of the first and second frames whether the first component comprises the first one of the dual tones.

12. (Original) The method of claim 11 wherein the first portion precedes the second portion in time for each of the first and second frames.

13. (Previously Presented) The method of claim 8 further comprising formatting the first component into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, the first portion of the frame precedes the second portion of the frame in time for each of the first and second frames, and bypassing the detection step of the first one of the dual tones for the first portion of the second frame if the detection for the first one of the dual tones does not detect the first one of the dual tones in the second portion of the first frame.

14. (Currently Amended) A method of detecting a tone in a voice packet having a plurality of voice frames, the method comprising:

receiving the voice packet over a network;
separating the voice packet into its first and second components;
determining a frequency for each of the first and second components; and
detecting as a function of the determined frequency for each of the first and second components whether either of the first and second components comprises the tone, wherein the tone detection is delayed until the last frame of the voice packet is processed received.

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15. (Previously Presented) The method of claim 14 wherein the tone detection comprises comparing the determined frequency of each of the separated first and second components to a plurality of frequency ranges to determine whether either of the first and second components comprises the tone.

16. (Cancelled)

17. (Previously Presented) The method of claim 14 wherein the separating step comprises bandpass filtering the voice packet into its first and second components.

18. (Original) The method of claim 17 wherein the frequency determination comprises down-sampling the filtered first and second components.

19. (Previously Presented) The method of claim 17 wherein the bandpass filtering comprises complex filtering.

20. (Original) The method of claim 14 wherein the frequency determination comprises converting the separated first and second components into complex signals.

21. (Previously Presented) The method of claim 79 wherein the tone detection further comprises comparing a ratio of the power estimation for the first and second components to a threshold.

22. (Cancelled)

23. (Previously Presented) The method of claim 14 wherein the frequency determination further comprises estimating a mean frequency deviation from one of a plurality of

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frequencies for each of the first and second components and comparing each of the estimated means to a respective threshold.

24.-26. (Cancelled)

27. (Previously Presented) The system of claim 81 wherein the separated component comprise first and second portions, the tone detection system further comprising a state machine to invoke the detector to detect the tone in the second portion of the separated component.

28. (Previously Presented) The system of claim 27 wherein the first portion precedes the second portion in time.

29. (Previously Presented) The system of claim 81 wherein the separated component comprise first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, the tone detection system further comprising a state machine to invoke the detector to detect the tone in the second portion of the first frame, and to invoke the detector to process the tone in the first portion of the second frame only if the detector detects the tone in the second portion of the first frame.

30. (Previously Presented) The system of claim 29 wherein the first portion precedes the second portion in time for each of the first and second frames.

31. (Currently Amended) A system for detecting a tone in a voice packet having a plurality of voice frames, comprising:

means for receiving the voice packet over a network

means for separating the [[the]] voice packet into first and second components;

means for determining a frequency for each of the separated first and second components; and

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means for detecting as a function of the determined frequency for each of the first and second components whether either of the first and second components comprises the tone, wherein the tone detection is delayed until the last frame of the voice packet is processed received.

32. (Cancelled)

33. (Previously Presented) The system of claim 31 wherein the determination means comprises means for estimating a mean frequency deviation from one of a plurality of frequencies for each of the first and second components and comparing the mean of each of the first and second components to a respective threshold.

34. (Previously Presented) The system of claim 31 further comprising means for converting the first and second components to complex signals prior to the frequency determination

35. (Previously Presented) The system of claim 31 wherein the separating means comprises a first bandpass filter to pass the first component and a second bandpass filter to pass the second component.

36. (Previously Presented) The system of claim 35 wherein each of the bandpass filters comprises a complex filter.

37. (Previously Presented) The system of claim 31 further comprising means for downsampling the separated first and second components prior to the frequency determination.

38. (Previously Presented) The system of claim 31 wherein the detection means comprises means for comparing the determined frequency of each of the first and second

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components to a plurality of frequency ranges to determine whether either of the first and second components comprises the tone.

39. (Currently Amended) A system of detecting a dual tone in a voice packet having a plurality of voice frames comprising:

 a buffer for receiving the voice packet over a network;

 a first bandpass filter to separate the first component from the voice packet;

 a second bandpass filter to separate the second component from the voice packet;

 a first detector to determine a frequency of the separated first component;

 a second detector to determine frequency of the separated second component;

 a first comparator to compare the frequency of the first component to at least one of a plurality of frequency ranges to determine whether the separated first component comprises one of the dual tone [[tones]]; and

 a second comparator to compare the frequency of the separated second component to at least one of the frequency ranges to determine whether the second component comprises the other one of the dual tone [[tones]], wherein the determination of the dual tones is delayed until the last frame of the voice packet is processed received.

40. (Cancelled)

41. (Currently Amended) The dual tone detection system of claim 39 wherein each of the first and second comparators comprises a frequency calculator that estimates a mean frequency deviation from one of a plurality of frequencies for each of the separated first and second components and compares the mean of each of the separated first and second components to a respective threshold.

42. (Currently Amended) The dual tone detection system of claim 39 further comprising a first summer to convert the separated first component to a first complex signal prior

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to the frequency determination by the first detector, and a second summer to convert the separated second component to a second complex signal prior to the frequency determination by the second detector.

43. (Original) The dual tone detection system of claim 39 wherein each of the first and second bandpass filters comprises complex filters.

44. (Previously Presented) The dual tone detection system of claim 39 further comprising a first downampler to downsample the separated first component prior to the frequency determination by the first detector, and a second downampler to downsample the separated second component prior to the frequency determination by the second detector.

45. (Cancelled)

46. (Currently Amended) Computer-readable media embodying a program of instructions executable by a computer to perform a method for detecting a tone in a voice packet having a plurality of voice frames, the method comprising:

receiving the voice packet over a network;
sampling a portion of each of the plurality of voice frames in the received voice packet; and

detecting from the sampled portion of the voice frame whether the voice frame comprises the tone, wherein the tone detection is delayed until the last frame of the voice packet is processed received.

47. (Cancelled)

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48. (Currently Amended) The computer-readable media of claim 46 wherein the tone detection comprises detecting from [[the]] a second portion of the frame whether the ~~separated component~~ voice frame comprises the tone.

49. (Cancelled)

50. (Currently Amended) The computer-readable media of claim 46 wherein the method further comprises formatting each voice frame into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, and wherein the tone detection comprises detecting from the second portion of the first frame whether the ~~separated component~~ voice frame comprises the tone.

51. (Original) The computer-readable media of claim 50 wherein the first portion precedes the second portion in time for each of the first and second frames.

52. (Previously Presented) The computer-readable media of claim 46 wherein the method further comprises formatting each voice frame into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, the first portion of the frame precedes the second portion of the frame in time for each of the first and second frames, and bypassing the tone detection step for the first portion of the second frame if the tone detection does not detect the tone in the second portion of the first frame.

53. (Currently Amended) Computer-readable media embodying a program of instructions executable by a computer to perform a method for detecting a tone in a voice packet having a plurality of voice frames, the method comprising:

receiving the voice packet over a network;
separating the voice packet into its first and second components;

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determining a frequency for each of the first and second components; and detecting as a function of the determined frequency for each of the first and second components whether either of the first and second components comprises the tone, wherein the tone detection is delayed until the last frame of the voice packet is processed received.

54. (Previously Presented) The computer-readable media of claim 53 wherein the tone detection comprises comparing the determined frequency of each of the separated first and second components to a plurality of frequency ranges to determine whether either of the first and second components comprises the tone.

55. (Cancelled)

56. (Previously Presented) The computer-readable media of claim 53 wherein the separating step comprises bandpass filtering the voice packet into its first and second components.

57. (Original) The computer-readable media of claim 56 wherein the frequency determination comprises down-sampling the filtered first and second components.

58. (Previously Presented) The computer-readable media of claim 56 wherein the bandpass filtering comprises complex filtering.

59. (Original) The computer-readable media of claim 53 wherein the frequency determination comprises converting the separated first and second components into complex signals.

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60. (Previously Presented) The computer-readable media of claim 88 wherein the tone detection further comprises comparing a ratio of the power estimation for the first and second components to a threshold.

61. (Cancelled)

62. (Currently Amended) The computer-readable media of claim 53 wherein the frequency determination further comprises ~~further comprising~~ estimating a mean of frequency deviation from one of a plurality of frequencies for each of the first and second components to a respective threshold.

63. (Cancelled)

64. (Currently Amended) A data transmission system, comprising:
a telephony device having a voice packet having a plurality of voice frames ~~comprising a plurality of voice frames~~; and
a signal processing system coupled to the telephony device, the signal processing system comprising a detector to sample a portion of ~~the separated each of~~ the plurality of voice frames in the voice packet, and detect from the sampled portion of the voice frame whether the voice frame comprises a tone, wherein the signal processing system delays the tone detection until the last frame of the voice packet is processed received.

65. (Cancelled)

66. (Currently Amended) The data transmission system of claim 64 wherein the ~~separated component~~ voice frame comprises first and second portions, and the signal processing system further comprising a state machine to invoke the detector to detect the tone in the second portion of the ~~separated component~~ voice frame.

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67. (Original) The data transmission system of claim 66 wherein the first portion precedes the second portion in time.

68. (Currently Amended) The data transmission system of claim 64 wherein the ~~separated component~~ voice frame comprise first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, and wherein the signal processing system further comprising a state machine to invoke the detector to detect the tone in the second portion of the first frame, and to invoke the detector to process the tone in the first portion of the second frame only if the detector detects a tone in the second portion of the first frame.

69. (Original) The data transmission system of claim 68 wherein the first portion precedes the second portion in time for each of the first and second frames.

70. (Original) The data transmission system of claim 64 wherein the telephony device comprises a telephone.

71-77. (Cancelled)

78. (Previously Presented) The method of claim 14 further comprising estimating a characteristic different from the frequency for each of the first and second components, wherein the tone detection is further a function of the estimated characteristic.

79. (Previously Presented) The method of claim 78 wherein the characteristic comprises power.

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80. (Previously Presented) The method of claim 79 wherein the tone detection further comprises comparing the estimated power for each of the first and second components to a threshold.

81. (Currently Amended) A system for detecting a tone in a voice packet having a plurality of voice frames comprising:

 a [[a]] receiver to receive the voice packet over a network;

 a sampler to sample a portion of each of the plurality of voice frames in the received voice packet; and

 a detector to detect from the sampled portion of the voice frame whether the voice frame comprises the tone, wherein the tone detection is delayed until the last frame of the voice packet is processed received.

82. (Previously Presented) The system of claim 31 further comprising means for estimating a characteristic of each of the first and second components, the detection means detecting whether either of the first and second components comprises the tone further as a function of the estimated characteristic for each of the first and second components.

83. (Previously Presented) The system of claim 82 wherein the characteristic comprises power.

84. (Previously Presented) The system of claim 31 further comprising means for estimating power of each of the first and second components, the detection means detecting whether either of the first and second components comprises the tone further as a function of a ratio of the estimated power of the first and second components.

85. (Currently Amended) The system of claim 39 further comprising a first power estimator to estimate power of the separated first component, the first comparator further

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comparing the estimated power of the separated first component to a power threshold, the determination of whether the separated first ~~signal~~ component comprises said one of the tones being further a function of the comparison.

86. (Currently Amended) The system of claim 39 further comprising first and second power estimators each estimating power of a respective one of the first and second separated components, and a twist estimator to compare a ratio of the estimated power for the first and second components, the determination of whether the ~~composite signal~~ voice packet comprises the dual tone being further a function of the comparison.

87. (Previously Presented) The computer-readable media of claim 53 wherein the method further comprises estimating a characteristic different from the frequency for each of the first and second components, wherein the tone detection is further a function of the estimated characteristic.

88. (Previously Presented) The computer-readable media of claim 87 wherein the characteristic comprises power.